



GPM Global
Precipitation
Measurement



GPM/DPR Ground Validation Plan in Japan

Shuji Shimizu (JAXA/EORC)



Japanese GV principles

We have two strategies for GPM/DPR GV activities.

1. Pre-launch GV for algorithm development

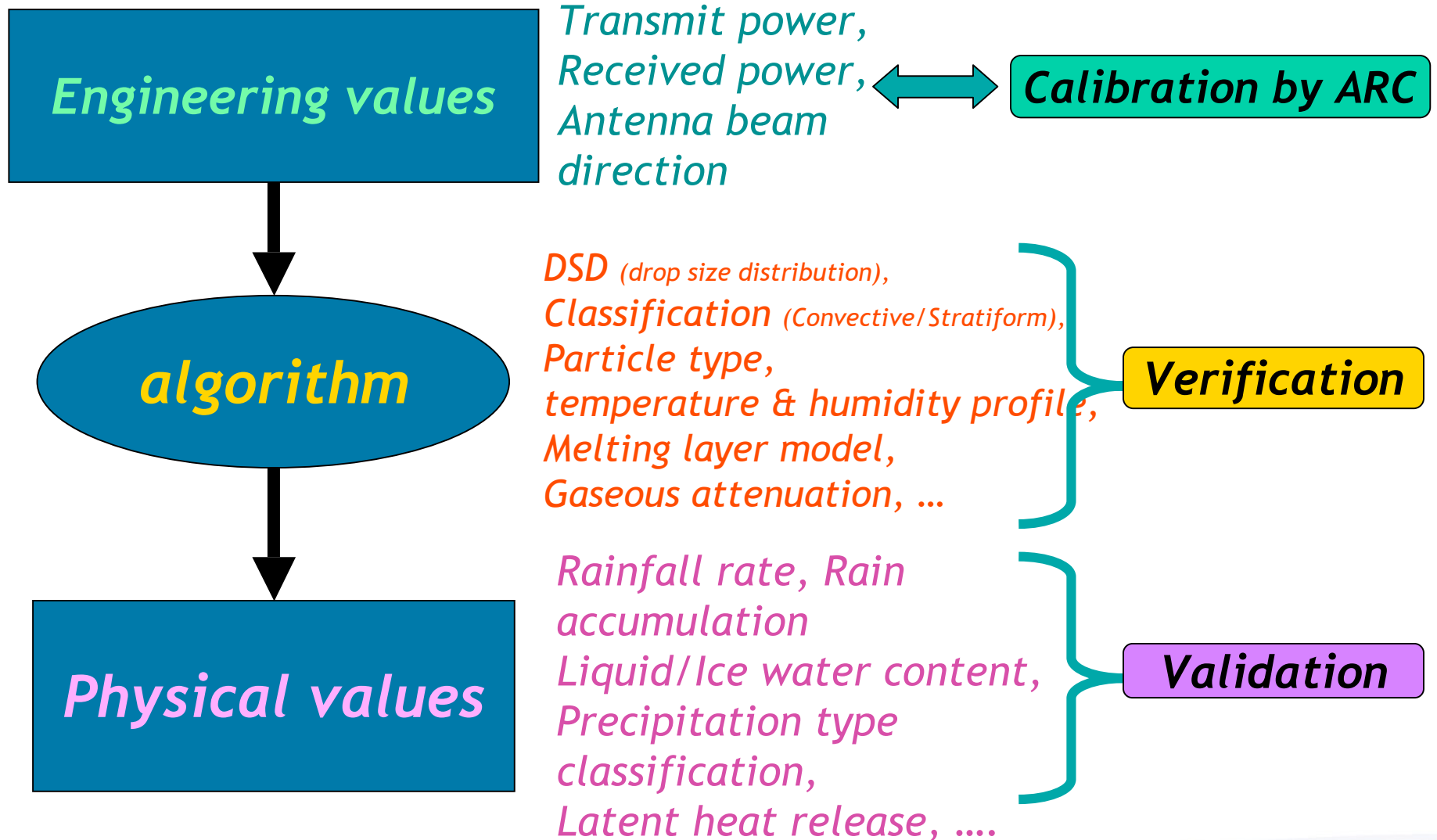
- * Algorithm specific validation for each rain retrieval algorithm of DPR before GPM-core satellite launch*

2. Post-launch GV for algorithm improvement and product validation

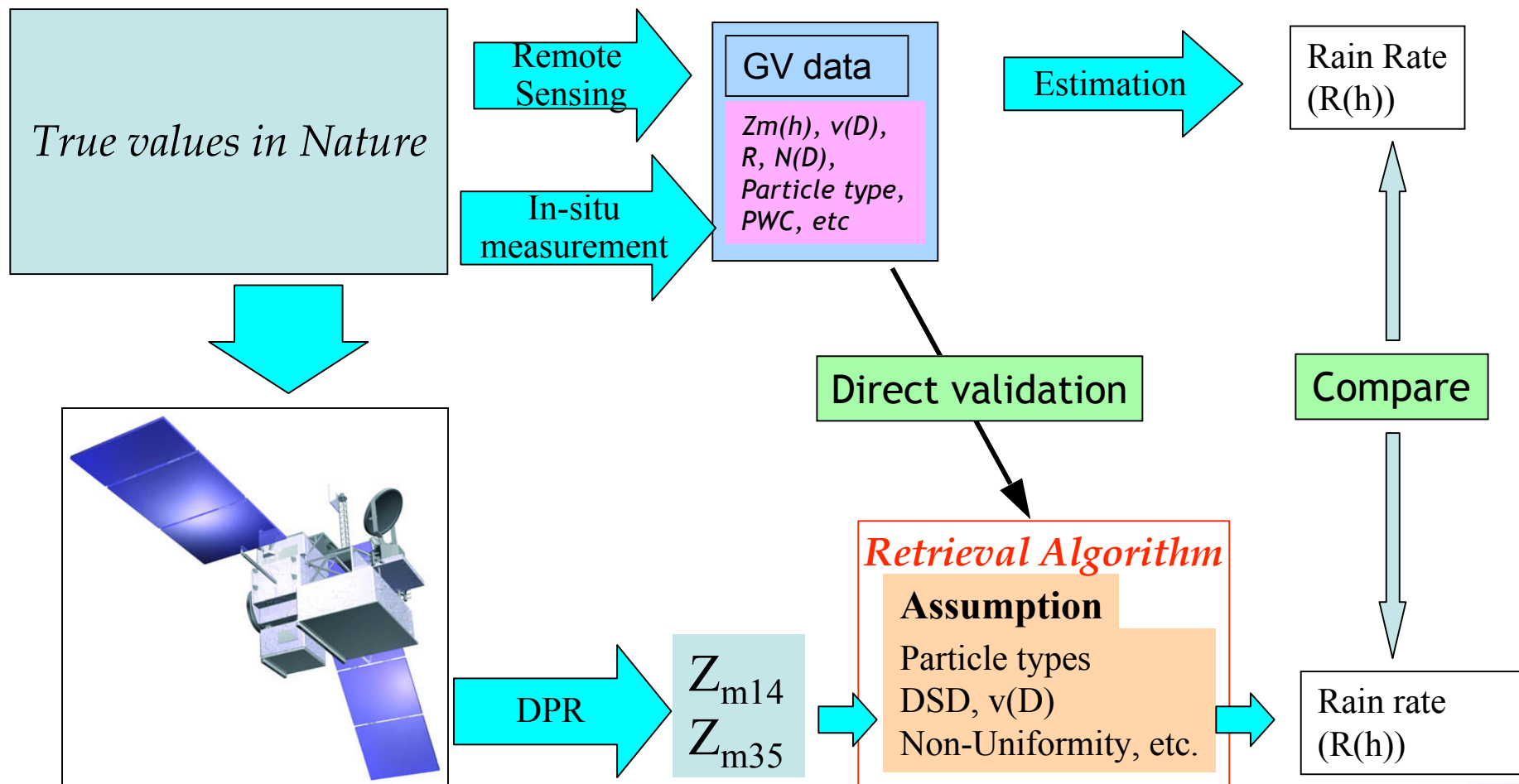
- * Calibration using ARC and instantaneous comparison with well-calibrated instruments after GPM-core satellite launch*
- * Statistical comparison with long-time observation data and operational data, especially for precipitation map data*



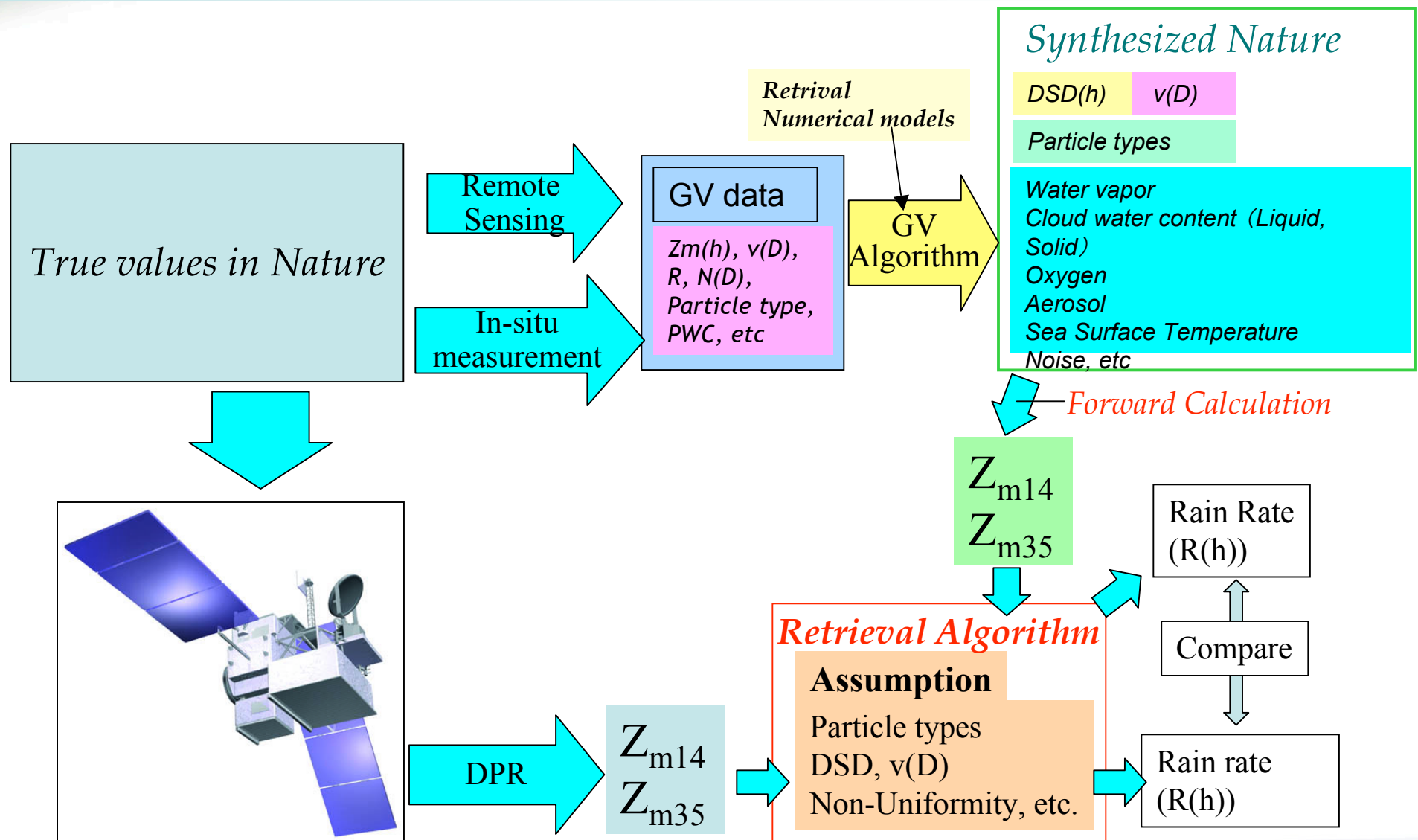
DPR/GPM Calibration/Validation



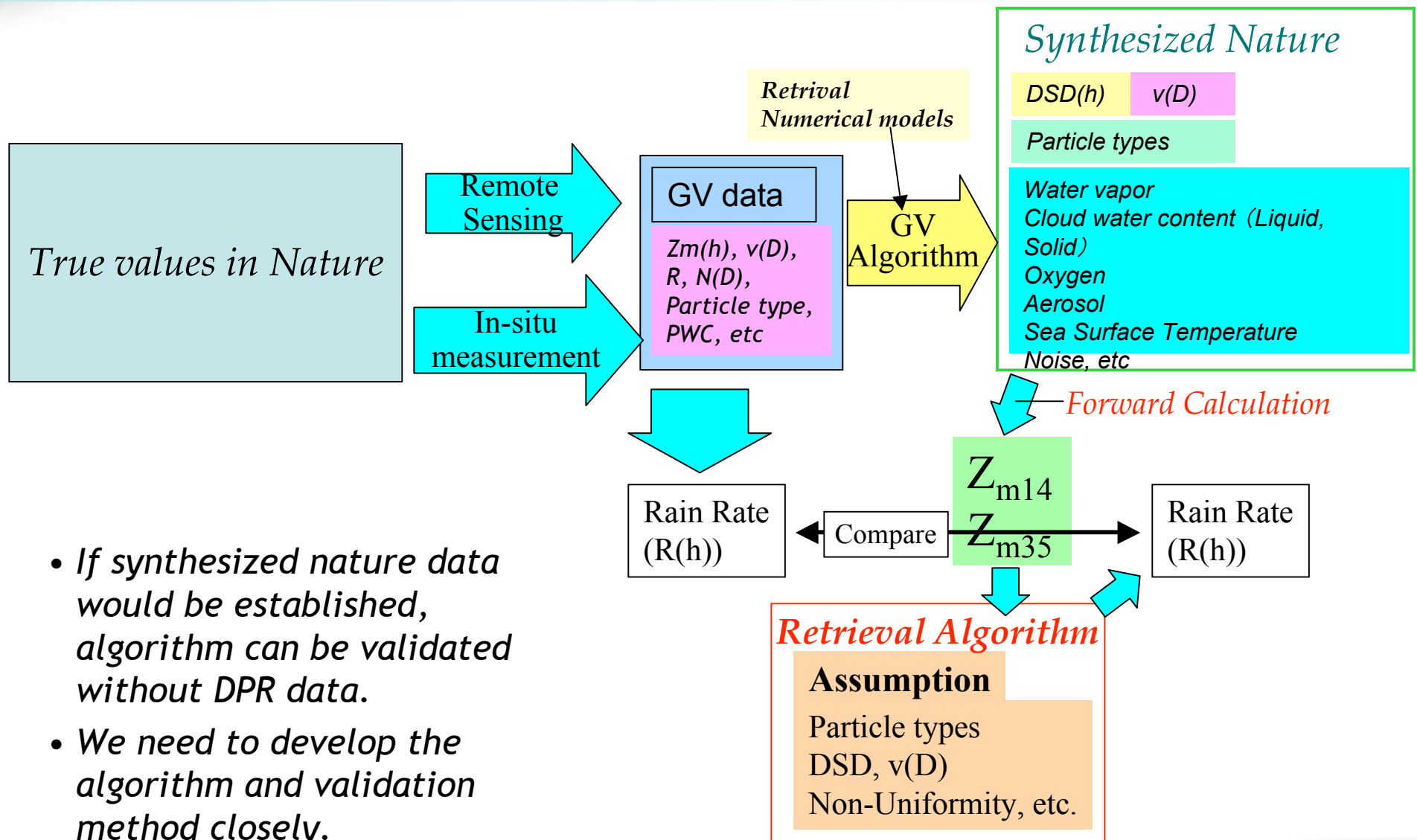
Conventional validation with DPR



New paradigm for algorithm validation with DPR



New paradigm for algorithm validation with DPR



- If synthesized nature data would be established, algorithm can be validated without DPR data.
- We need to develop the algorithm and validation method closely.



1. Pre-launch GV for algorithm development

- * *DPR algorithms are developed by algorithm developers in Japanese GPM Science Team.*
- * *Microphysics - GV - microphysical modeling linkage is important for construction of synthesized nature.*
- * *Observation of microphysical parameters are essential.*
 - * *We already have observation materials for microphysical parameters in NICT Okinawa.*
 - * *Rain gauges*
 - * *Dual-polarization radars*
 - * *Wind profilers*
 - * *Micro rain radars*
 - * *2-D video disdrometers, etc.*
- * *We plan campaign observations for GV and algorithm development carried out 3 years before the GPM-core satellite launch. ← JFY 2010*
- * *Detection of parameters of synthesized nature is most important and difficult challenge.*



GPM GV Supersites

- GV site for rain is Okinawa.
- GV site for dry snow is Sapporo.

- * Sapporo (Hokkaido University) already has many facilities for snow observation.
- * Continuous observations
 - * X-band Doppler Radar, 2DVD, MRR, Snowfall Rate Measurement, AWS, etc.

Sapporo
(43N, 141E)

Nagaoka
(37.5N, 139E)

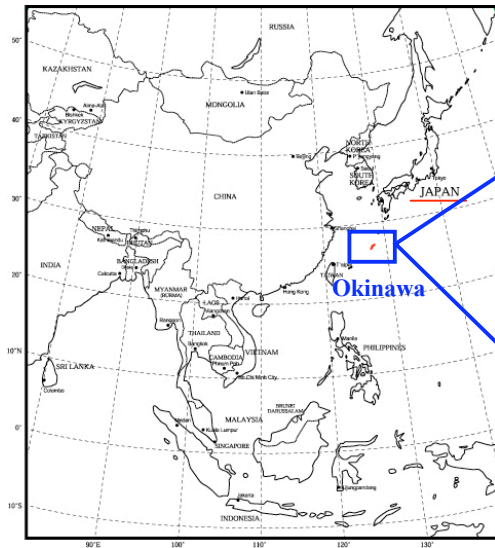
Okinawa Subtropical Environment Remote Sensing Center
- C-band multiparameter radar, wind profiler, etc.

Okinawa (26N, 128E)

Campaign observation in Okinawa was carried out in May and June 2004 for CREST-GSMaP activity. We are now investigating the data for GPM GV.



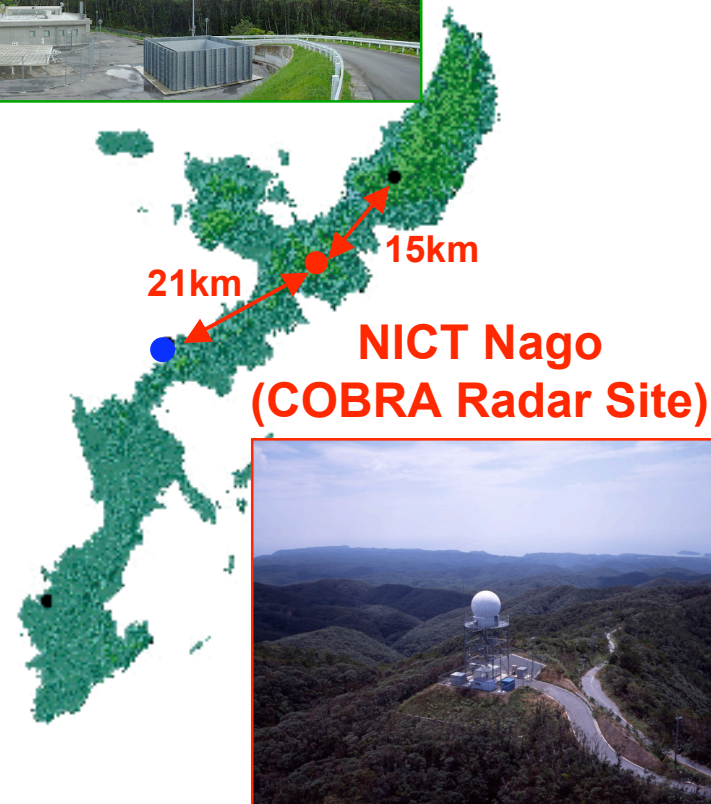
DPR GV Super Site @ NICT Okinawa



NICT Okinawa



NICT Ogimi
(400MHz WPR Radar Site)

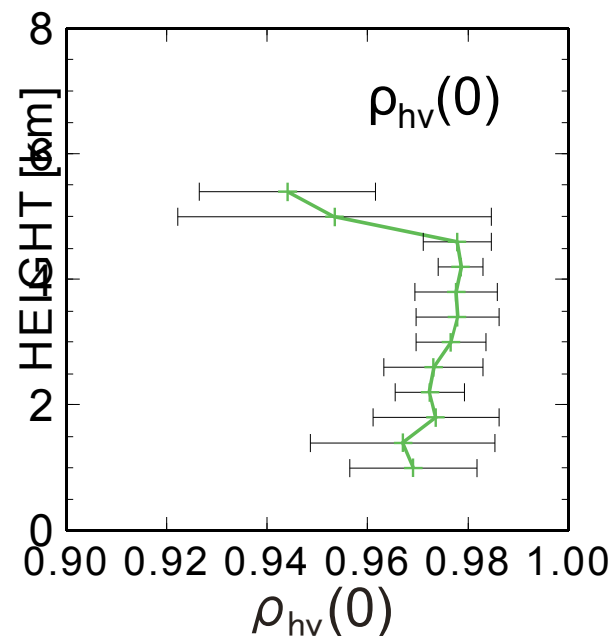
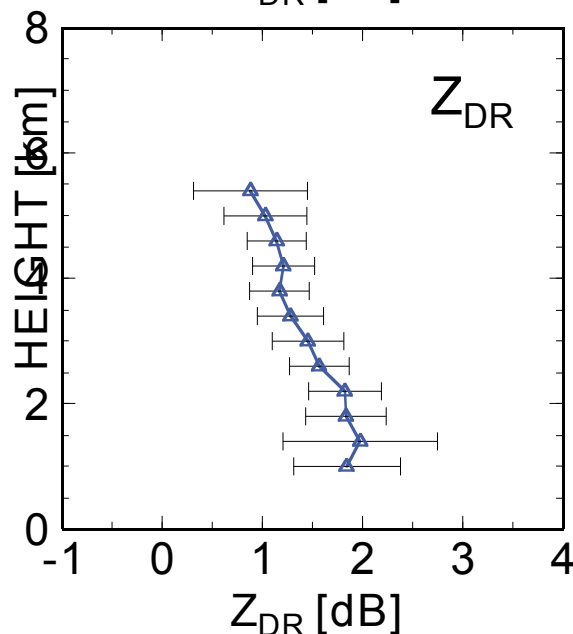
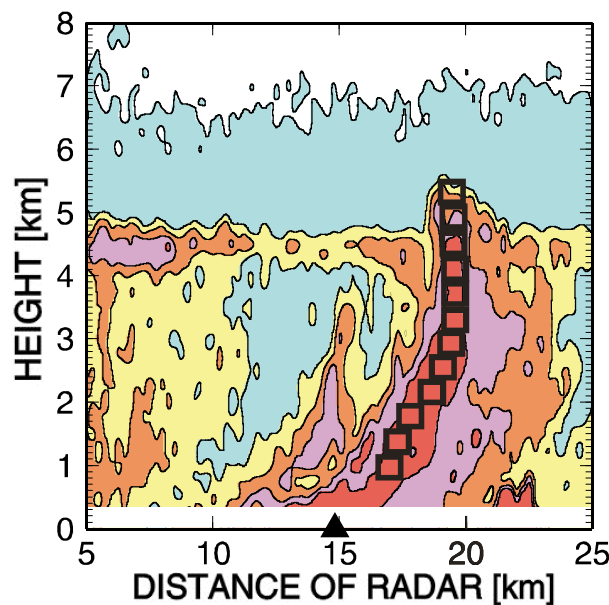
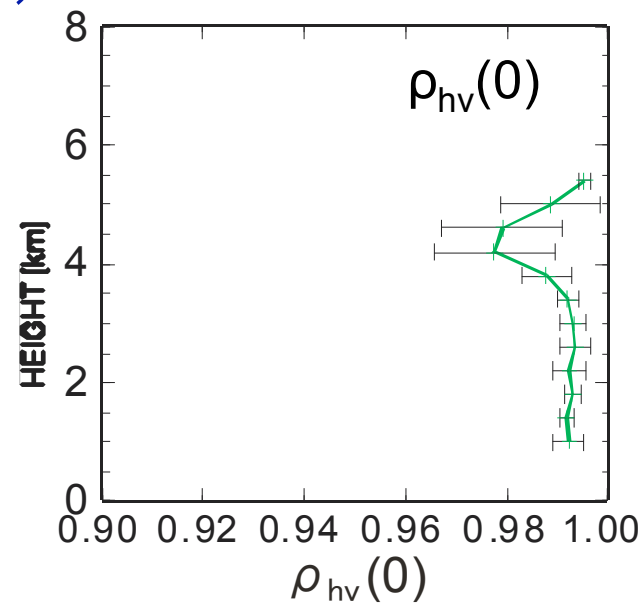
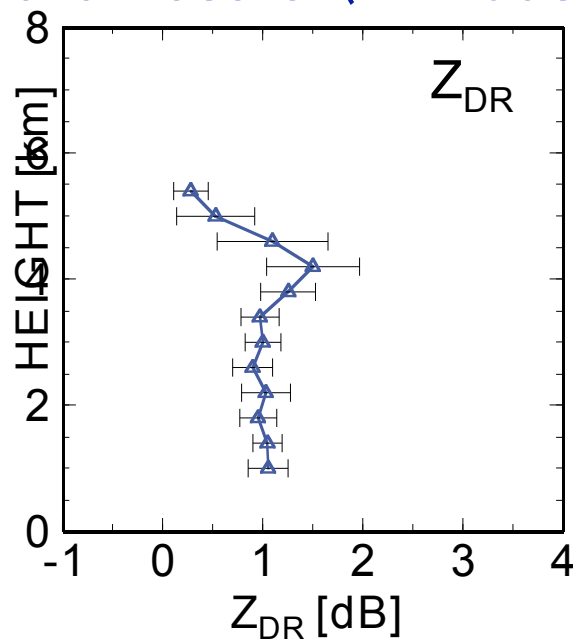
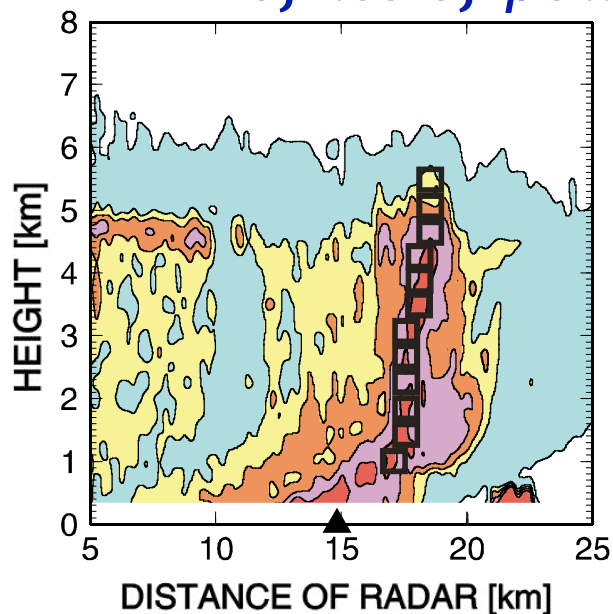




An Example of the Okinawa Observation

Profiles of pol. Parameters (RHI data)

(Oue, Uyeda & Shusse)





Example of the Okinawa Observation

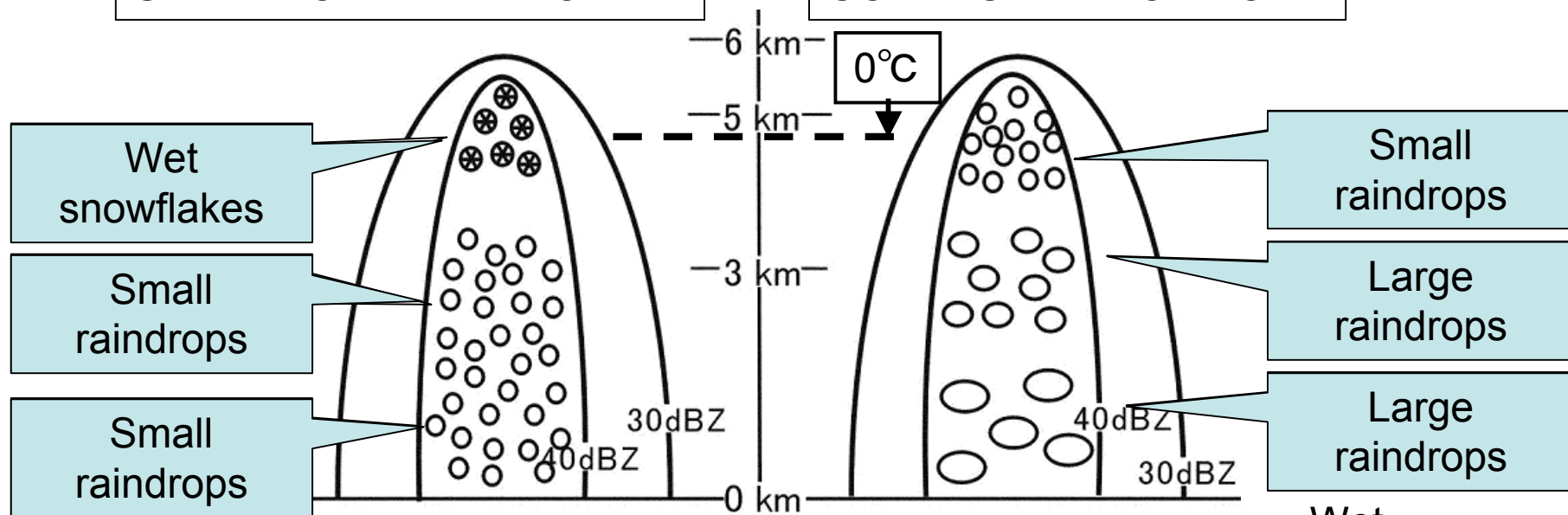
Global Precipitation Measurement



We showed DSD and vertical distribution of precipitation particles of convective cells associated with the Baiu frontal rainband on 10 June 2006.

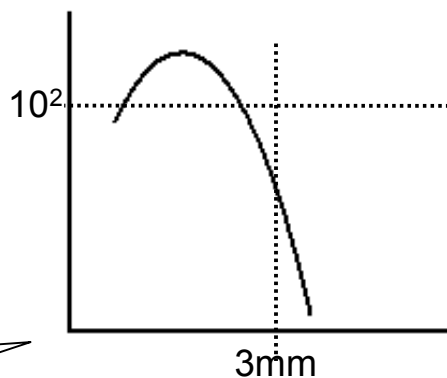
THE CONVECTIVE CELL
EMBEDDED IN THE
STRATIFORM RAIN ZONE

THE CONVECTIVE CELL
ALONG THE
CONVECTIVE PORTION

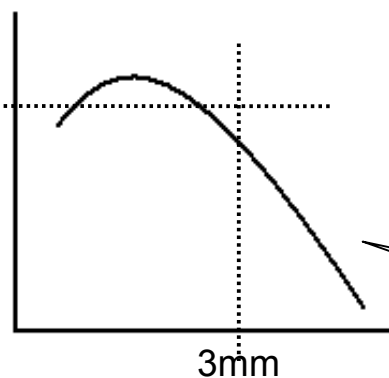


DSD

NUMBER



NUMBER



Wet snowflakes

Raindrops

DIAMETER (Oue, Uyeda & Shusse)

DPR algorithm development with GV activities

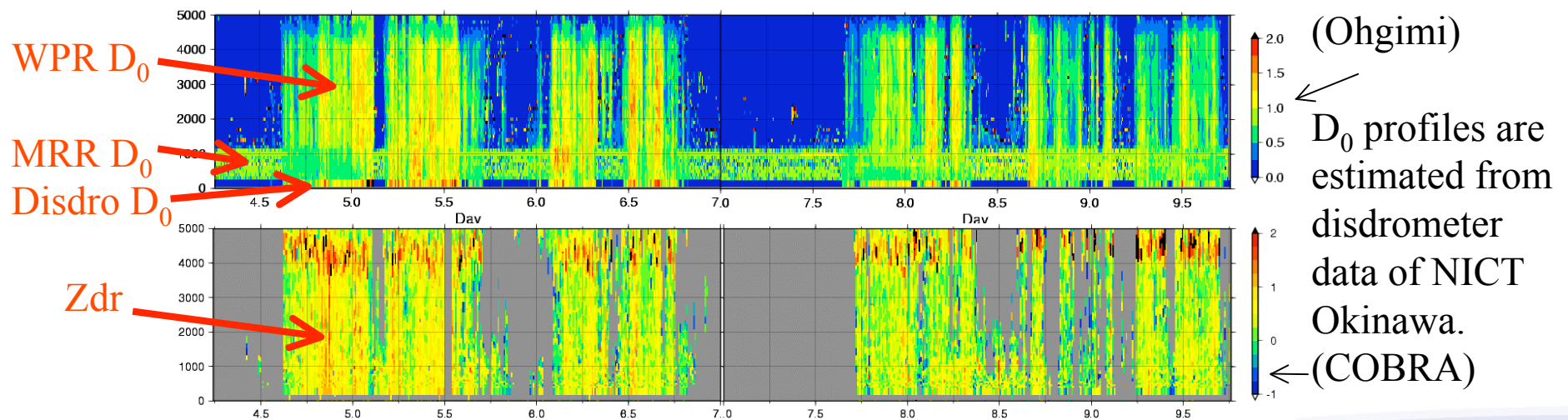
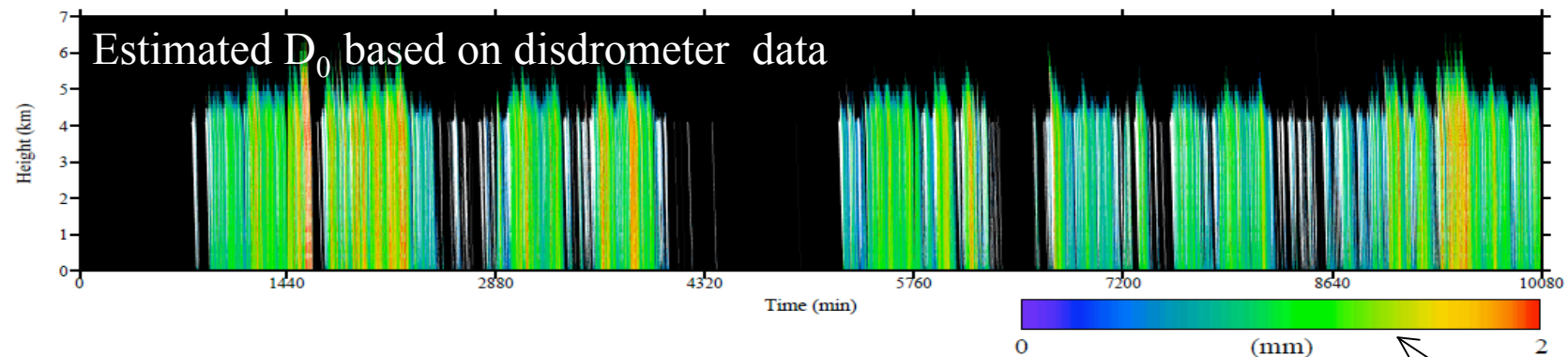
- * *Simultaneous development of the precipitation retrieval algorithms and their validation methods is essential.*
 - à *DPR/GMI combined algorithm development is one example.*
- * *The development of the algorithm are started with Dr. Masunaga, Nagoya Univ. on contract research of JAXA.*
- * *Test data for development and the validation of the algorithm are constructed using Okinawa validation data.*



Construction of Synthetic data for Algorithm and GV

❖ Test data for algorithm GV

- ❖ Precipitation and DSD profiles derived from multiple ground-based datasets on NICT Okinawa





2. Post-launch GV for algorithm improvement and product validation

- * *Long-term GV data will be needed for instantaneous comparison with well-calibrated instruments after launch.*
 - * *Precipitation amounts with Rain gauges,*
 - * *Radar reflectivities,*
 - * *Drop size distributions,*
 - * *Run-off data, etc.*

- * *Various GV data on various climatological types are crucial for algorithm improvement after launch of GPM-core satellite, especially in Asian countries.*



Asian Collaboration for GPM GV

Many Asian countries have already prepared to use GPM data for disaster monitoring (flood warning and assessment, landslides, drought, etc) and prediction models.

Flood warning/risk map activities in several “too much water” countries.

Precipitation data with high resolution (spatial and temporal) are essential: GPM will surely contribute.

Combination of other satellite data: GMS cloud images, land images (e.g. Landsat for monitoring flooded, erosion, etc., and also atmospheric/hydrological models)

Ground validation and also evaluation through real (different and diversified) applications

Follow-up Asian GPM workshop will be held on 2-4 June 2008 at Hamamatsu Japan.



GPM
Global Precipitation Measurement

GSMaP GV activities

- ❖ Utilizing the results of the GSMaP (Global Satellite Mapping of Precipitation) project sponsored by the Japan Science and Technology Agency
- ❖ 0.1 degree grid, one hour averaged precipitation map
- ❖ Available on the web about **four hours** after observations (<http://sharaku.eorc.jaxa.jp/GSMaP/>)
- ❖ JAXA will succeed activities of GSMaP under the GPM project.

<http://sharaku.eorc.jaxa.jp/GSMaP/index.htm>

Global Rainfall Map in Near Real Time

JAXA/EORC

Last up date: 2007/Nov/20 03:15:02 UTC

>> Japanese

Date: 2007 / Nov / 19 21:00-21:59 UTC Submit

Latest
10 hours

24h
Movie

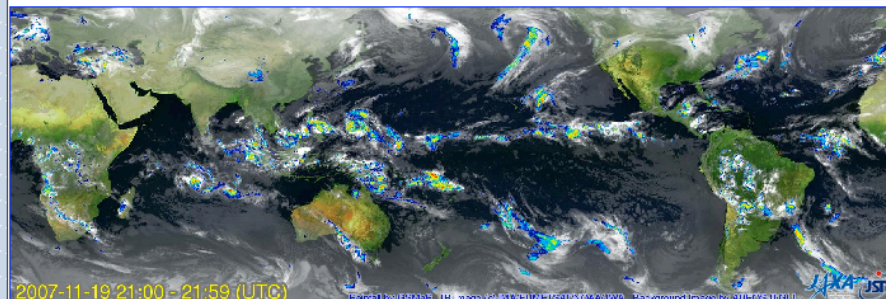
Pre <<

Latest

>> Next

MWR
Coverage

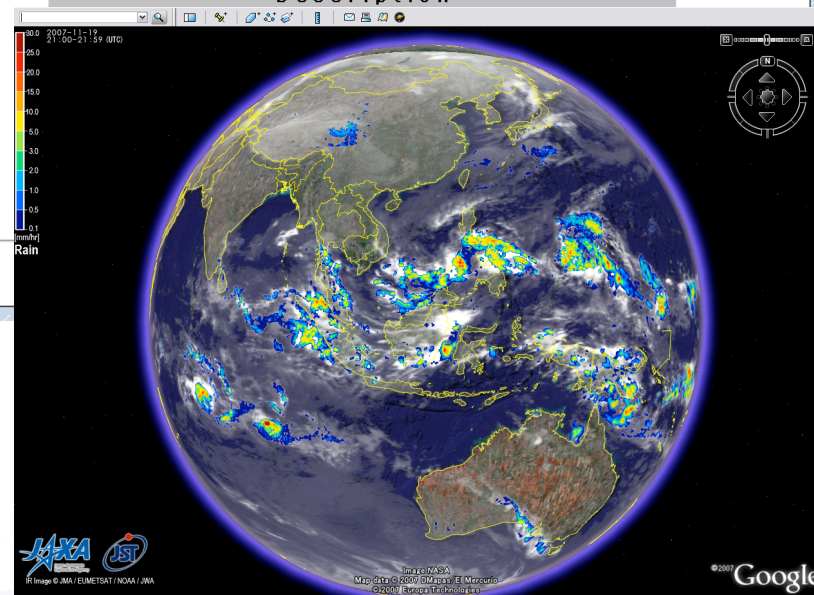
Google
Earth



Rain 0.1 0.5 1.0 2.0 3.0 5.0 10.0 15.0 20.0 25.0 30.0 [mm/hr]

We offer hourly global rainfall maps in near real time (about four hours after observation) using the combined MW-IR algorithm with TRMM TMI, Aqua AMSR-E, DMSP SSM/I and GEO IR data. This system was developed based on activities of the JST-CREST [GSMaP \(Global Satellite Mapping of Precipitation\)](#) project.

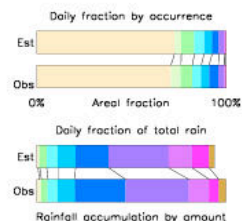
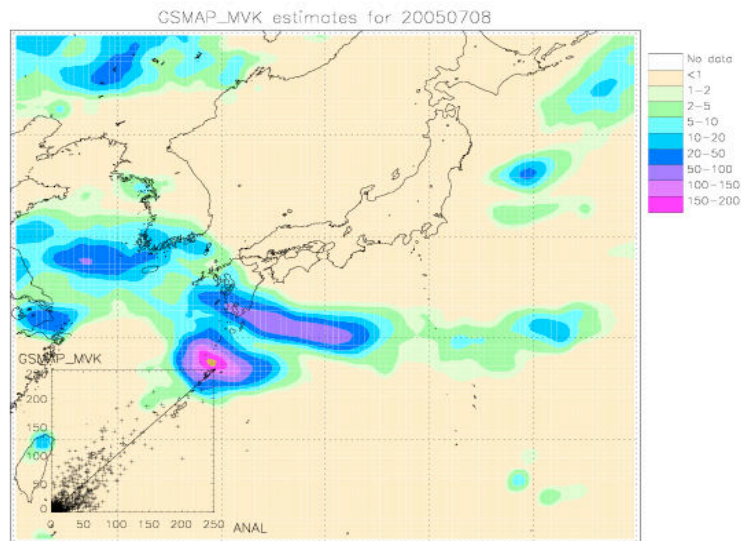
Description





Validation using JMA Radar-AMeDAS Analysis

GSMaP_MVK



GSMAP_MVK		
	<1	≥1
<1	2502	159
≥1	235	857

Verification statistics for 20050708 n=3753 Verif. grid=0.25° Units=mm/day

	Analysed	GSMaP_MVK	
# gridpoints raining	1092	1016	Mean abs error = 3.3
Average rain	6.3	5.9	RMS error = 9.6
Conditional rain	21.5	21.7	Correlation coeff = 0.881
Rain volume (mm*km²*10⁹)	15.3	14.3	Frequency bias = 0.930
Maximum rain	232.5	214.1	Probability of detection = 0.785
			False alarm ratio = 0.156
			Hanssen & Kuipers score = 0.725
			Equitable threat score = 0.588

(8 July 2005)

- The GSMaP joins the IPWG/PEHRPP activities and validates various satellite estimates around Japan using JMA Radar-AMeDAS analysis.
- Comparisons in daily averaged rainfall estimates with 0.25 x 0.25 deg. resolution are shown in <http://www.radar.aero.osakafu-u.ac.jp/~gsmmap/IPWG/dailyval.html>

Summary

* *We have two strategies for GV activities.*

1. Pre-launch GV for algorithm development

- * *We have started to construct test data for the synthesized nature using existing data sets of Okinawa.*
- * *DPR algorithm development has been progressed from this fiscal year with new contract research of JAXA.*
- * *Campaign observation for microphysics in JFY2010*

2. Post-launch GV for algorithm improvement and product validation

- * *Statistical comparison with long-time observation data and operational data, especially for precipitation map data*
 - * *Asian collaboration & Asian GPM WS in next June*
 - * *GSMaP GV activities*

* *Issues*

- * *Concrete strategy for GV and the campaign observation, especially for snow*
- * *Establishment of GV algorithms and Synthesized Nature is very difficult and challenging.*